

CLAIMS

What is claimed is:

1. A flame-retardant flexible tubing bundle construction, said tubing bundle extending in an axial direction along a central longitudinal axis to an indefinite length, and in a radial direction circumferentially about said longitudinal axis, said tubing bundle construction comprising:
 - 5 one or more plastic tube members each extending axially along said longitudinal axis and being arranged with the other said tube members radially about said longitudinal axis to form a bundle;
 - at least one thermal transfer layer surrounding said bundle of said tube members; and
 - at least one fire-resistant layer surrounding said thermal transfer layer, fire-resistant
 - 10 layer being formed of a fibrous material.
2. The flame-retardant flexible tubing bundle construction of claim 1 wherein said tube members each is formed, independently, of a thermoplastic material selected from the group consisting of polyamides, polyolefins, silicones, fluoropolymers, polyvinyl chloride, polyurethanes, and copolymers and blends thereof.
3. The flame retardant flexible tubing bundle construction of claim 1 wherein said thermal transfer layer is formed of a metal foil material.
4. The flame retardant flexible tubing bundle construction of claim 3 wherein said metal foil material is formed of a metal selected from the group consisting of aluminum, copper, brass, and alloys thereof.
5. The flame retardant flexible tubing bundle construction of claim 3 wherein said metal foil material has a thickness of between about 1/25 mm (5 mil) to 25 mm (10 mil).

6 The flame-retardant flexible tubing bundle construction of claim 3 wherein said metal foil material is formed as a tape wrapped spirally about said bundle.

7 The flame-retardant flexible tubing bundle construction of claim 1 wherein said fibrous material is formed of fibers selected from the group consisting of aramid fibers, azole fibers, and blends thereof.

8 The flame-retardant flexible tubing bundle construction of claim 7 wherein said aramid fibers are selected from the group consisting of poly-paraphenylene terephthalamide fibers, poly(m-phenyleneisophthalamide) fibers, and blends thereof; and wherein said aramid fibers are selected from the group consisting of polyphenylene bezobisoxazole fibers, polybenzimidazole fibers, and blends thereof.

9 The flame retardant flexible tubing bundle construction of claim 7 wherein said fibrous material is formed as a non-woven fabric.

10 The flame retardant flexible tubing bundle construction of claim 9 wherein said non-woven fabric is formed as a tape wrapped spirally about said thermal transfer layer.

11 The flame retardant flexible tubing bundle construction of claim 1 wherein said fibrous material has a Limiting Oxygen Index (LOI) of at least about 0.30.

12 The flame-retardant flexible tubing bundle construction of claim 1 further comprising a moisture barrier layer surrounding said fire-resistant layer.

13 The flame retardant flexible tubing bundle of claim 12 wherein said moisture barrier layer is formed of a polymeric film.

14 The flame-retardant flexible tubing bundle construction of claim 13 wherein said polymeric film is formed of a polymeric material selected from the group consisting of

polyesters, polyimides, polyamides, polyolefins, silicones, fluoropolymers, polyvinyl chloride, polyurethanes, natural and synthetic rubbers, and copolymers and blends thereof.

15 The flame-retardant flexible tubing bundle construction of claim 14 wherein said polymeric film is formed as a tape wrapped spirally about said fire retardant layer.

16 The hose of claim 1 further comprising a jacket surrounding said fire-resistant layer.

17 The hose of claim 16 wherein said jacket is formed of one or more layers of a polymeric material selected, independently, from the group consisting of polyurethanes, polyamides, polyolefins, silicones, polyvinyl chlorides, polyurethanes, and copolymers and blends thereof.

18 The flame-retardant flexible tubing bundle construction of claim 1 wherein said thermal transfer layer has a thermal conductivity of at least about $0.14 \text{ W/m} \cdot \text{K}$.

19 A flame retardant flexible tubing bundle construction, said tubing bundle extending in an axial direction along a central longitudinal axis to an indefinite length, and in a radial direction circumferentially about said longitudinal axis, said tubing bundle construction comprising

5 one or more plastic tube members each extending axially along said longitudinal axis and being arranged with the other said tube members radially about said longitudinal axis to form a bundle, and

at least one fire resistant layer surrounding said bundle of said tube members, said fire resistant layer being formed of a fibrous material.

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20 The flame retardant flexible tubing bundle construction of claim 19 wherein said thermal transfer layer is formed, independently, of a thermoplastic material selected from

the group consisting of polyamides, polyolefins, silicones, fluoropolymers, polyvinyl chloride, polyurethanes, and copolymers and blends thereof.

21 The flame-retardant flexible tubing bundle construction of claim 19 wherein said fibrous material is formed of fibers selected from the group consisting of aramid fibers,azole fibers, and blends thereof.

22 The flame retardant flexible tubing bundle construction of claim 21 wherein said aramid fibers are selected from the group consisting of poly-paraphenylene terephthalamide fibers, poly(m-phenyleneisophthalamide) fibers, and blends thereof, and wherein said aramid fibers are selected from the group consisting of polyphenylene bezobisoxazole fibers, polybenzimidazole fibers, and blends thereof.

23 The flame-retardant flexible tubing bundle construction of claim 21 wherein said fibrous material is formed as a non-woven fabric.

24 The flame-retardant flexible tubing bundle construction of claim 23 wherein said non woven fabric is formed as a tape wrapped spirally about said thermal transfer layer.

25 The flame-retardant flexible tubing bundle construction of claim 19 wherein said fibrous material has a Limiting Oxygen Index (LOI) of at least about 0.30.

26 The flame retardant flexible tubing bundle construction of claim 19 further comprising a moisture barrier layer surrounding said fire resistant layer.

27 The flame-retardant flexible tubing bundle of claim 26 wherein said moisture barrier layer is formed of a polymeric film.

28 The flame retardant flexible tubing bundle construction of claim 27 wherein said polymeric film is formed of a polymeric material selected from the group consisting of

polyesters, polyimides, polyamides, polyolefins, silicones, fluoropolymers, polyvinyl chloride, polyurethanes, natural and synthetic rubbers, and copolymers and blends thereof.

29. The flame-retardant flexible tubing bundle construction of claim 28 wherein said polymeric film is formed as a tape wrapped spirally about said fire retardant layer.

30. The hose of claim 19 further comprising a jacket surrounding said fire-resistant layer.

31. The hose of claim 30 wherein said jacket is formed of one or more layers of a polymeric material selected, independently, from the group consisting of polyurethanes, polyamides, polyolefins, silicones, polyvinyl chlorides, polyurethanes, and copolymers and blends thereof.